

THE USE, MISUSE AND ABUSE OF SOIL

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The title of this note is an elaboration of the heading of a chapter of the book 'Only One Earth'. It is the outcome of an unofficial report commissioned by the Secretary General of the United Nations Conference on the Human Environment, prepared with the assistance of a 152 member Corresponding Consultants in 58 countries. Barbara Ward and Rene Dubos are the authors of the book.

This report was primarily prepared with man's concern for the environment. Today, just seven years after the report was published, I wish to call the attention of this group of scientists—agronomists and soil scientists—who are discussing a group of agricultural plants that are cultivated almost exclusively in the tropics.

By this, I do not imply that tropical soils are something quite distinct or unique from temperate soils. For, from what little that is known of tropical soils, it is now accepted, that they are similar or equivalent to soils in the temperate regions, specifically, in soil organic matter content (Sanchez and Buol, 1975). However, the development of soil management practices, particularly of the tropical plantation crop soils, is often different because of the more acute effects of environmental, economic, vegetational and demographic factors. Let us look into these briefly.

Air, soil and water are the basic requirements of biological productivity. While air and water are in a way renewable, soil is not for all practical purposes. Only less than half the earth's surface is land, and according to the FAO, only 11% land surface is arable and as much as 70% land is unsuitable for any kind of agricultural activity. Thus, with land being so limited in availability, and with the present trend in world's population increase (it is expected to

become 6 to 7 billion in 2000 AD from the present 4 billion) it is essential that we use land most carefully. But, what we see today is a total unconcern about this. While we hear often about the denudation of forests and the pollution of air and water, no one seems to express any concern about the misuse and abuse of land that is going on so widely in areas where plantation crops and forests are grown, even under official auspices.

Pimental *et al.* (1976) has given a succinct account of the consequences of present day soil management in USA, the country which probably has the best developed soil conservation system in the world. According to them, under natural conditions, it takes 600 to 1400 years to form 5 cm soil; under normal management this is reduced to about 200 years and under ideal soil management 5 cm soil is formed in 60 years (this is 7.5 t top soil/ha/year). The average annual loss of top soil from agricultural land is 30 t/ha. Thus, the annual loss of soil due to erosion is several times the rate at which it is formed. At this rate, where will it lead to, say in 100 years from hence and in a country such as ours, with our high density of population and almost no concern or appreciation about soil conservation? It can only be visualised!

It has also been estimated that three-fourths of the water borne sediments end up in reservoirs, rivers and lakes (Pimental *et al.*, 1976). In the west coast of India, which receives upwards of 3000 mm precipitation annually, we can easily conjure up the condition of our numerous hydroelectric and irrigation projects, say 30 or 50 years from hence, unless something is urgently done for soil conservation, particularly in our forests.

In recent years, several states in India have started forest plantation corporations. Most of them have borrowed heavily from financial institutions, at high rates of interest. And possibly in the anxiety to get quick returns for their investment, they have taken to the cultivation of such money-making plants as dioscoreas, cardamom and black pepper in a most unplanned—almost indiscriminate—manner without taking adequate precautions for soil conservation. In the process it also breaks up the prevailing co-systems of the forests.

Another point of concern is the planting of savannas and grasslands with forest trees, and often with species like eucalyptus which may not be able to support any vegetation underneath it. I feel that we should immediately take up some detailed studies on this aspect before we plant more forest areas—particularly slopy lands—with eucalyptus.

Because of their lush appearance and thick canopy cover, it is generally assumed that tropical forest lands could be made into rich farm lands. This has encouraged the establishment of lot of authorised, unauthorised and politically inspired human settlements in the forest areas. Man has been the worst enemy of forests, and such settlements can cause great damage in several ways.

The practice of jhumming or shifting cultivation is in vogue in several tropical regions of the world. About 30% of the world's exploitable soils are at present estimated to be under shifting cultivation and they support about 8% of the world's population (King and Chandler, 1978). Traditionally, with the custom and knowledge of the development of both crops and trees that the jhumming communities possessed and the low intensity of population which the system supported, the ecological environment of the forest lands used for this system of agriculture was assured of a relatively stable balance and permitted a resuscitation of the soil. But when unscrupulous people from the plains took up this practice, as it has happened in recent years, it has meant a depredation of forests and irreparable loss of the top soil. With the increasing pressure of population on the land, it may be necessary to develop such jhummed areas first. Cultivation of perhaps plantation crops, in combination with sound soil conservation measures and a multilevel or multistoreyed system of cultivation to optimise productivity can be taken up.

In the USA, 0.5% of arable land is estimated to be lost annually to highways, urban and other uses (Pimental *et al.*, 1976). The problem is equally acute and perhaps more desperate in most other parts of the world, especially in regions of the most intensive human settlements, which incidentally are also the most arable or fertile of all lands (Ward and Dubos, 1972). Such an abuse of land is very visible all over India also, on the outskirts of all urban settlements.

A concomitant abuse of land comes from using the rich top soil in such areas for making bricks required for construction purposes. I am not aware of anyone having raised a public outcry against this gross abuse of land. It is paradoxical that when laws have been legislated banning the use of agricultural land for cultivating cash crops, none has thought about putting a stop to this gross abuse.

Time will not permit me to go further into such and similar other instances of misuse and abuse of land. I shall instead try to enumerate the steps that we may take to reduce the seriousness of the situation: (1) Land use or land development boards should be set up with statutory powers to decide how a particular area of land should be put to use. If we can enact clean air acts and anti-pollution acts, a legislation for this is all the more necessary, as land is more limiting than air and water. (2) Forests should be zoned under which only certain kinds of activities should be permitted in a particular zone. (3) Adoption of soil conservation measures should be made mandatory. Since land belongs to the country, the expenditure incurred for land development and soil conservation should be borne by the State. In areas prone to soil erosion, cultivation of row crops should be discouraged or even banned. Row crops like cotton and corn accounted for a soil loss of 50 t/ha/year while wheat crops cause only 12 to 25 t loss in the same area (Pimental *et al.*, 1976). Likewise, "up and down hill" planting of potato caused a top soil loss of 36 t ha/year while planting on the contours caused a loss of only less than 0.3 t/ha.

In temperate regions, for several reasons, zero tillage or minimum tillage is becoming steadily popular. This practice has been seen to reduce erosion by half (Carter, 1976). It would be worthwhile to take up some research on the effects of this practice in the various plantation crops also.

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